Republic of Benin

Ministère de la Santé Publique (MSP)

Institut Régional de Santé Publique (IRSP)

Catholic Relief Services (CRS)

Anthropometry Survey of Nutritional Status of Children 18 to 36 Months of Age in the Departments of Borgou and Alibori, Benin

BASELINE REPORT

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List of Acronyms

AC	*Animatrice Communautaire* - Community Health Promoter
BHR/FFP	Bureau for Humanitarian Response/Office of Food for Peace
CDC	Center for Disease Control
CPS	*Centre de Promotion Sociale* Social Promotion Center
CS	Child Survival
CSSP	Child Survival Support Program attached to Johns Hopkins University
DAP	Detailed Activity Plan
DHS	Demographic Health Survey
DPP	Detailed Program Plan (Multi-year program plan), currently DAP
DPS	*Direction de la Protection Sociale* - Department of Social Protection
FACS	Food Assisted Child Survival Program
FNP	Food and Nutrition Program (administered by Cellule PAN)
EPI	Expanded Programme on Immunization
IGA	Income Generating Activity (small or micro enterprise).
IMR	Infant Mortality Rate
KPC	Knowledge, Practice, (Vaccination) Coverage Survey developed by Johns Hopkins University
MCH	Maternal Child Health Program
MIS	Management Information System
MSP	*Ministère de la Santé Publique* - Ministry of Public Health
NCHS	National Center for Health Statistics
NGO	Non-governmental Organization
ORT	Oral Rehydration Therapy
VSDC	Village Social Development Committee
WHO	World Health Organization

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EXECUTIVE SUMMARY

Since 1982, the Government of Benin in partnership with CRS/Benin has carried out a Maternal Child Health (MCH) Program whose principal objective has been the reduction of malnutrition rates for children aged 0 to 24 months. In the course of the previous decade, this program has undergone a many revisions aimed at improving both the implementation strategy of the activities of the program and show donors the impact of the program on beneficiaries.

Despite encouraging results and continuous improvement in program activities, two principal challenges remained for the program. On the one hand, it was necessary to implement an advanced strategy to:

- improve targeting of beneficiaries so that the most needy can participate, and

- ensure the sustainability of program activities such that the beneficiaries themselves progressively took over program management.

On the other hand, the donor community was unanimous in its need to have concrete results showing improved impact in order to justify the resources given to such programs worldwide. This required not only the identification of measurable indicators but also the development of new tools that are inexpensive enough to be useful to NGOs and accurate enough to show progress. That is why

- First, MPSF and CRS/Benin designed the community based Food Assisted Child Survival (FACS) Program to bring the program closer to social infrastructures destitute zones, hence, entrusting the management of program activities to the populations themselves.

- Second, the two counterparts decided to conduct a KPC survey before the FACS activities are launched. This survey will contribute to collecting baseline data in the communities relating to vaccination coverage and the health knowledge and practices of mothers in maternal child health.

The community based Food Assisted Child Survival Program (FACS) is currently being executed in the Departments of Ouémé, Plateau, Mono, and Couffo, whereas in the other eight departments (administrative regions) which include the Departments of Borgou and Alibori, the program is still being conducted just like in the past, i.e. center-based where women from rural areas have to go to MCH centers. CRS/Benin in partnership with MPSF received financial and material support from Title II and Farm Bill grants for a period of five years in order to implement progressively the new PAN approach in which approximately 42,500 beneficiaries would receive a small monthly ration of food as from 1st October 1996 through 30 September 2000 in the village communities of the 12 departments of Benin.

In order to collect baseline data, the MSP and CRS conducted a survey from 23 August 31 August 1999, in a representative sample of 58 targeted communities of the Food Assisted Child Survival (FACS) program in the Departments of Borgou and Alibori. Funded by USAID/Benin, this survey was conducted with the technical support IRSP. The Food and Nutrition Program Unit (Cellule/PAN) of CRS/Benin also collaborated on the survey.

The survey goals were:

- to appreciate the distribution of the anthropometry indices[1] (height-age; weight-age; and

[1]The measurements used in this survey are height, weight, and age. When these measurements are combined, we obtain the values for the different anthropometric indices which are height for age, weight for age, and weight for height. The indicators used in this study are moderate and severe malnutrition as define by standard deviation from mean for the reference population.

weight-height) in children aged 18 to 36 months of age in a representative sample of 58 rural and urban FACS project communities in the Departments of Borgou and Alibori, and

- to train a group of qualified persons in the Departments of Borgou and Alibori to be capable of conducting anthropometry surveys in the future.

The survey provided reliable information which allowed the determination of nutritional status in the project target zone as from the first year of project activities. The survey objectives were completed in four weeks. CRS/Benin and IRSP held intense reflections based on the survey results in order to evaluate the project activities provided for in the proposal and to have data to contribute in writing a future Detailed Activity Plan (DAP).

The principle survey results after going through 637 questionnaires show that:

- 35,5% of the children aged 18 to 36 months of age surveyed suffer from chronic malnutrition, indicated by stunting and 9,34% of the same children illustrate severe stunting,

- 29,0% of children surveyed are underweight with 5.5% or 35 of the 637 children illustrating severe underweight.

- Only 39 of the 637 children surveyed suffer from acute malnutrition illustrated by wasting of 6,1% of the population surveyed.

- The mean z-score for stunting is -1.60 and for underweight children, it is -1.45, whereas for wasting, the mean z-score is -0.64. The first two averages illustrate a high level for the two indices.

1. INTRODUCTION

1.1 Background

CRS/Benin, a PVO with its headquarters in Baltimore, MD, has been implementing a national social protection program in Benin since 1958. This program has been jointly implemented with different ministries in charge of the agency for social affairs. The project receives Title II resources from the American government. It was a simple assistance program to those at risk for food insecurity. Its primary activity was the distribution of imported foods from the United States. The U.S. public law No. 480 outlines the conditions under which such foods are distributed by USAID, while the Bureau for Humanitarian Response, Office of Food for Peace (BHR/FFP) concerns itself principally with logistical management of these foods.

Beginning in 1982, CRS/Benin decided, in consultation with its Beninese government counterpart, to use an important part of these Title II resources to reinforce a social development program (The Food and Nutrition Program) instead of outright social assistance for which the impact was difficult to estimate. The new program, known as the Food and Nutrition Program **(PAN**), will be executed in 95 Mother Child Health Centers (MCH Centers) spread throughout Benin national territory. The large majority of these centers are government run (MOH-68 centers; Ministry of Rural Development-9 centers) while the rest are either Catholic Church run (15 Centers) or managed by Community Organizations (3 Centers).

These centers are essentially located in the administrative seat of the sub-prefectures. Thus, the target group for PAN, namely, the poorest populations lacking in health and social infrastructures, often have to travel long distances to take advantage of the services offered by the program. Approximately 50,000 children aged 0 to 24 months participate on a regular monthly

basis in the program's activities of growth monitoring and follow up of the vaccination schedule. The program also conducts health information sessions on family hygiene, child nutrition, immunization, treatment of children's diarrhea, breast feeding, etc… for the children's mothers during these growth monitoring sessions. To provide incentive for the mothers and some children to participate into the program, a Title II food ration accompanies the growth monitoring and education activities. An income generating activities (IGA) component is also provided for in the MCH program in order to encourage the mothers who wish to start a small income generating activity like a small commerce, group gardening activities or transformation of agricultural products.

Despite the positive results of this Maternal and Child Health program, past evaluations conducted in 1993 and 1995 have shown the following insufficiencies:

- National program coverage remains low (around 7 % of the target population).

- The manner in which program participants are registered at the center does not necessarily guarantee that the true target population is being reached. Given the location of existing MCH centers, it is not surprising to find that many of the participating mothers come from urban and semi urban areas.

- Community involvement in the implementation of program activities remains low.

- Malnutrition rate for children between 0 and 2 years of age has not significantly decreased from the national level average of 35% despite the many years in which the program has existed.

- Many of the messages used to educate and sensitize the mothers further to growth

monitoring sessions are not put into practice in the households. Reasons for this include mothers' low purchasing power. Individual income generating micro-projects set up to address participants' poverty did not come to their expectations.

- Mothers participating into the MCH program and wishing to implement good practices that enhance family health do not have the support from other family members (husbands, mothers, aunts, grandmothers, and other relatives). They are often opposed to changes made by the mother, who happens to be the only member of the household educated at the MCH centers, thus, the only one who understands the advantages of such change of behavior.

Given these insufficiencies, a community based Food Assisted Child Survival (FACS) Program has been chosen as the most appropriate strategy. This approach which is based on the implementation of FACS activities within targeted communities by a trained local organization, seeks to reinforce community capacity to solve not only their own health problems, but the bulk of development issues that might confront them. With a well elaborated program of activities, well conceived education messages targeted to the needs of each community according to the strengths and weaknesses revealed by the KPC, and with adequate supervision, one could expect a much more important impact.

For the new strategy to succeed, it is critical to identify a number of measurable progress indicators at different periods during the project life of activity. The current anthropometry survey contributes to that objective and complements the KPC survey conducted at the same time. The standard anthropometry survey is based on three principle indices:

- Height for age,

- Weight for age, and

- Weight for height.

In 1991, USAID recommended that all PVOs demonstrate the impact of nutritional project through anthropometric data collection.

In order to conduct that survey, a team of trainers consisting of Dr. Victoire AGUEH, Dr. Edgar-Marius OUENDO, and Dr. David HOUETO trained surveyors and supervisors in areas regarding:

- the objectives of the survey, its organization and the contents of the questionnaire,
- the technique of weighing and measuring with exactness and precision,
- precautions to be taken to reduce gaps in reading and registering measurements.

1.2 Objectives of the Survey

The objectives of the survey are as follows:

- to study the distribution of the indices "height for age", "weight for age", and "weight for height" in children 18-36 months old in a representative sample of the 58 Borgou and Alibori communities where CRS is implementing activities,

- to obtain baseline data contributing to measure the impact of PBC on the nutritional status of children aged 18-36 months.

At the end of the survey, the Ministry of Public Health, the Ministry Social Protection and Women's Condition (MPSCF), and Catholic Relief Services will have the following information on the status of child malnutrition in the Departments of Borgou and Alibori:

- the percent of children showing moderate or severe stunting,
- the percent of children suffering from moderate or severe underweight, and
- the percent of children suffering from moderate or severe wasting.

1.3. Schedule of Activities

1.3.1 26 May 1999: First preparatory meeting of the core team members

- Introduction, discussion of the survey objectives, development of work schedule,
- Choice of survey site,
- Division of tasks among core team members.

1.3.2 04 August 1999: Second meeting of the core team

- Development of the training schedule and the calendar of the survey
- Discussion of activities undertaken by each member of the core team
- Preparation of training materials

1.3.3 11 August 1999: Third meeting of the core team

- Continuation of preparatory activities
- Micro-planning of surveyors and supervisors' training sessions
- Discuss technical, pedagogical and logistical materials to be used in training sessions

1.3.4 23 August through 27 August 1999

- Training followed by an evaluation of the surveyors and supervisors' skills on the anthropometry survey to be held in Parakou (department of Borgou), and making of survey teams
- Organization of the teams for data collection

1.3.5 28 August 1999 through 31 August 1999

- Anthropometry data collection in the survey communities selected in the Departments of Borgou and Alibori.

1.3.6 01 September 1999 through 22 September 1999

- Verification of questionnaires completed by clusters
- Double data entry in Epi Info
- Elaboration of the plan of analysis
- Data analysis

1.3.7 23 through 30 September 1999

- Follow up of data analysis
- Begin report writing

1.3.8 01 through 08 October 1999

- Final report given to CRS/Benin by IRSP

2. STUDY AREA

The study took place in the departments of Borgou and Alibori which once made up the former department of Borgou. Both are located in the north-east region of Benin. The department of Alibori is bordered to the north-west by the Republic of Niger, to the north-east by Burkina Faso, to the south-east by the department of Atacora, to the south-east by the department of Borgou, and to the west by the Republic of Nigeria.

The Department of Borgou is bordered to the south by the Department of the Hills, to the north by the department of Alibori, to the east by the department of Donga, and to the west by the Republic of Nigeria. The two departments cover together a land area of 52,098 km², i.e. approximately half the land area of Benin.

The department of Alibori is composed of six sub-prefectures including: Karimama, Malanville, Banikoara, Kandi, Gogounou, and Ségbana. It does not have a seat and a prefect yet, and is therefore still managed the political and administrative officers of the department of Borgou which seat is Parakou and is composed of seven sub-prefectures including: Sinendé, Bembêrêkê, Kalalé, Nikki, Pèrêrê, Parakou, and Tchaourou.

In 1999, the population of both departments was estimated at 140,656 inhabitants by the INSAE. The Bariba group is the most important one (41,70%) of the population. Islam is the prevalent religion with 63,5% of the population. In both departments, FACS is being executed in 58 communities, 34 of which are the Borgou. The main activities of the populations of these departments are: agriculture which includes an industrial production of cotton and peanuts, and farm produce including rice. Cattle rearing is very well developed. The climate is humid Sudanian with a rainy season from May to September, and a dry season from November to April.

3. METHODOLOGY

3.1. Type of Study

This anthropometric survey is essentially a descriptive, quantitative study during which data was collected through simple observation. The study focused on children 18 to 36 months in age in the Departments of Borgou and Alibori who were weighed and measured for height. Their age was determined from date of birth (if records were available) or otherwise, by estimation.

3.2. Sampling Frame

3.2.1. Estimation of the Parameters of the Population from the Sample

In order to obtain complete information about the different measurements--weight and height--of children aged 18 to 36 months which is the target population for the survey, the ideal strategy would be to visit each household with a child in the target age group in each of the 58 FACS project communities of the Departments of Borgou and Alibori. We would have obtained the parameters for the distribution of weight and height in the whole study area. These parameters are: the average, the mean, and the standard deviation (z-score). But it was impossible to visit each household. We however took a sample to describe the entire group. For the sample size, we can estimate the parameters which interest us and describe the level of confidence of our estimates. To do this, we performed random selections at each level (communities, village, household).

3.2.2. Household and Child Selection

Children aged 18 to 36 months constitute the primary sampling unit of the survey. The best technique for selecting such children would be to perform a simple random selection which would consist of making a list of all the children aged 18 to 36 months in all 58 FACS/Borgou-Alibori communities, assigning a number to each child, and putting all the numbers in a receptacle, and randomly drawing numbers until the desired number for the sample size is reached. However, it is not possible to obtain a list of all the children of the target age in the FACS project communities from these departments. We have therefore chosen a sampling method using a cluster selection with multiple steps. Each cluster represents a community. In the FACS program, a community can be considered a hamlet, a village, or a grouping of villages.

3.2.2.1. First Step

During this stage, the communities which make up the sample were chosen using a systematic method which was self-weighting according to population size. This was accomplished through two steps. 30 clusters (communities) were selected from the 58 FACS/Borgou-Alibori target communities among which data were collected. These 30 clusters were those selected for the KPC survey. The clusters represent primary sampling units.

3.2.2.2. Second Step

This step allowed the survey team to select the households to survey. As soon as a survey team arrived in a community, they would meet with the village chief or mayor and some of the members of the village development committee (CVDS) members to draw up a list of neighborhoods, hamlets or villages within the community. One locality is then randomly drawn. The supervisor then proceeds to the center of the randomly selected locality and randomly selects

a direction. S/he numbers all consecutive houses along the imaginary line indicated by the direction, and then randomly selects one of the various houses to begin the survey. The team then starts the survey from that house; it continues on the basis of the house whose door has the closest proximity to the first house until the 20 questionnaires per cluster are completed.

3.3. Sample Size

It is important to have a sample size that allows us to obtain a good estimation of the various statistical parameters (mean, median, standard deviations for weight and age) which interest us and to determine the margin of error with respect to the real values of the parameters within the study population. It is equally important to have a representative sample. The random selection with the cluster method guarantees representativeness. The precision is tied to the size of the sample: the larger the sample, the higher the precision. By using a parameter estimation and by choosing a level of desired precision, we can calculate the minimum sample size. For a survey such as ours, the minimum sample size is given by the following formula:

$$n = \frac{z^2 c(pq)}{d^2}$$

where **n** represents the minimum sample size;

z is determined by the desired statistical certainty;

c is the cluster effect which often has a value between 1.5 and 2.0;

p is the prevalence or coverage rate to be investigated; however, **p** is most often determined in such a way as the product of pxq has the highest possible value to obtain the largest sample size for the given values of z and d. For this reason, **p** is often equal to 0.5.

q = **1 - p**; and

d = precision desired.

The value of **d** depends on the precision or margin of error desired. For example if **d** = 0.05 (i.e., if we allow ourselves a 5% error), the statistical certainty chosen would be 95%. Most often, in a study such as ours, the chosen statistical certainty is 95%, which gives the corresponding value of 1.96 for **z**. The value is taken from a statistical table which corresponds to a population with a normal standardized distribution. Given the above values for **z, p, q** and **d** and assuming a cluster of effect of **c** equal to 1.5, the following sample size (**n**) to be determined will be:

$$\mathbf{n = \frac{(1.96 \times 1.96)(1.5)(0.5 \times 0.5)}{(0.05 \times 0.05)} = \frac{(3.84)(0.25)}{(0.0025)} = 576}$$

The number of clusters is not fixed, however, there are a number of theoretical reasons which suggest using at least 30 clusters and to equally distribute the final sample among the 30 clusters (Henderson, et. al., 1982).

By dividing the number 576 for the sample size by 30 clusters, we obtain the number 19.2 children per cluster which has been rounded up to 20 children for fear of losing precision. This gives us a final sample of n=600 children . These 600 children are equally divided up among the 30 clusters with 20 children aged 18 to 36 months each.

This sample size allows us to have more precision and to make comparisons among sub-groups within the sample (boys, girls, age groups, etc.), with a precision of at least 95%.

3.4. Data Collection Tools

Three types of data collection tools were used:

- a survey questionnaire,
- a Shorr height measuring board, and
- a hanging spring-dial scale (Salter type).

3.4.1. The Questionnaire

The questionnaire contained 11 questions selected by IRSP and CRS to assure the proper collection of information regarding the child's age, her standing height or recumbent length, and her weight (see Annex A). The first two questions are addressed to the mother or child's caretaker. They collect information such as the name of the child and mother in order to allow the survey team to quickly recover the mother in question should the supervisor discover that additional information is needed or that the survey is incomplete.

The third question collects information about the child's sex since the reference population was established according to gender.

Questions 4, 5, and 6 collect information about the child's exact age or estimated age the day the measurements are taken in order to determine the stature or position for taking the height measurement. Similarly, the reference population is designed to allow exact comparisons according to age in days. When a child is less than 24 months of age, his height is measured in a recumbent position; whereas when a child is 24 months or older, his height is taken in a standing position.

Question 7 allows us to collect information about the manner in which the child's birth date was verified.

Questions 8 and 9 allow spaces for the recording of recumbent length or standing height and weight.

Questions 10 and 11 require information about the quality of the measures taken and difficulties encountered by the surveyors and supervisors.

The **comment** section provides space for surveyors and supervisors to write down additional observations made during the data collection.

3.4.2. Shorr Measuring Boards and Scale

Each team (two surveyors and one supervisor) was equipped with one Shorr measuring board and one hanging spring dial scale (Salter type) in order to measure standing height or recumbent length and weight.

3.5. Training of Supervisors and Surveyors

3.5.1. Principal Objective

The principal objective of the training was to train the participants to take anthropometric measurements with precision and accuracy in children 18 to 36 months of age.

3.5.2. Training Objectives

At the end of the training the participants must be able to:

- explain the importance of the following anthropometric infant indices: height/age, weight/age, and weight/height,
- describe the instruments used to measure (scale and height measuring board),
- measure with precision weight and height in infants 18 to 36 months of age,
- explain the importance of taking anthropometric measures with precision,
- explain the different types of errors in anthropometric measurements
- take measures to minimize the errors and bias that may arise, and
- detect errors and identify their sources.

3.5.3. Before the Training

The training objectives, pedagogical methods, and the schedule of activities are those that were elaborated in 1997 for the anthropometry survey of the Ouémé Department. They were updated by a core team composed of professionals from IRSP, CRS/Benin and the FNP Unit.

The training document used during the training was the same document written by Mr. Irwin Shorr and translated into French from English in 1997 for the Ouémé Anthropometry Survey. The survey questionnaire and the supervision checklist were also the same as those developed that survey. The sheet used for determining the measuring position for the child and the age estimation sheet were updated by IRSP team.

3.5.4. During the Training

The training took place from 23 to 27 August 1999 at Hôtel de la Résidence (COTEB) in Parakou. In all, 20 surveyors and 10 supervisors from CRS, IRSP, DPS, and CPS Borgou were trained. Two observers from USAID also participated in the training session.

The training was concerned principally with two types of anthropometric measures -weight and height, and particular attention was given to the following items:

-Basic understanding of anthropometric indexes and indicators
-The use of measuring instruments,
-Correct measurement reading,
-Correct recording of measurements,
-Different measurement positions for height according to age,
-Studying and filling out the questionnaire, and
-Age estimation techniques in the absence of written documents.

Beginning on the second day of training, practical exercises were organized in the villages of Baprérou and Kpérou-Guéra situated approximately 30 km from Parakou. They helped surveyors and supervisors to practice measuring weight and height with precision and accuracy on children according to what was taught. These practical exercises allowed participants to practice operating the measuring instruments and reading and recording measurements.

During the afternoons, special training sessions were given to supervisors on the characteristics of anthropometry surveys and on the role they should play in the survey teams. These responsibilities can be summarized as follows:

- selection of the first home,
- supervision of the surveyors during age determination and during the taking, reading and recording of measurements in order to ensure quality and precision,
- validation of the questionnaire, and
- resolution of problems as they appear.

On the fourth day of the training, a standardization test was organized in the classrooms of the Public Primary School of Bapkérou village. This test enabled the trainers to assess the participants' skills regarding precision and accuracy in measuring height and weight. **Precision** is the ability to repeat the same measurement on the same subject independently with little variation. **Accuracy** is the ability to obtain measurements that are closest to the real measurement.

Analysis of the results showed that most participants had inferior height measurements to those of the trainer, Victoire Agueh. The main cause was found to be not positioning the child's knees correctly while measuring in standing position. The degree of accuracy in weight measurements was, on the whole, very good. The standardization test also allowed to point out specific reading and recording errors.

Group discussion sessions were organized following the standardization test so that participants could take consciousness of their mistakes, improve their measuring techniques, and thus guarantee quality data collection during the actual survey.

For the standardization test, the participants were separated into 3 groups of 10 members each working with 10 children per group. Each participant measured each child twice for standing height, the hardest measurement to take, and weight. Measures were taken independently so that participants could not recall their first height measurement before doing the second.

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Accuracy in the analysis of the results requires that measurements obtained be compared to the "real measurements," which are those done on each child by Dr. Victoire Agueh. The same strategy was used in comparing each participant's first and second measurements on each child to each other in order to assess accuracy. The results of the standardization test can be found in Annex D of this report.

3.6. Data Collection

Data collection started right after the training session. It was conducted over three consecutive days from August 28-31, 1999 in the 30 communities used as clusters during the KPC survey in the departments of Borgou and Alibori. Twenty-two surveyors and ten supervisors were separated into ten teams of three people each consisting of two surveyors and one supervisor. The data collection was coordinated by the core team.

When a survey team arrives in a household and after greeting the members, the team explains the survey goals to the head of the household and/or women before identifying any children between the ages of 18 and 36 months who will be weighed and measured. If these children exist in the household, the team then asks to see birth or other documents recording a precise date of birth. If she answers "no", the team uses the age estimation sheet attached to this report. The age and identification sections of the questionnaire are filled out before continuing on to the actual measurements of the child. The team proceeds in this manner until at least 20 children have been measured in each cluster.

If, for one reason or another, correct measurements were not taken or when the child presents physical deformities that might affect the accuracy of the standing height or recumbent length, an extra child 18-36 months old was measured to replace the previous one. This explains a number in excess of 20 children measured in certain clusters.

Each supervisor stayed with their team until the end of the survey. All of the completed questionnaires were verified at the survey site before leaving.

3.7. Data Entry

After the survey, an IRSP team checked the number and contents of questionnaires by cluster. In each cluster, the questionnaires were numbered 1 to 20 or more, according to the number of children surveyed in a cluster.

The data entry was done twice by two data entry specialists working independently and simultaneously on two different computers using EPI-INFO, one beginning with the 30th cluster, the other with the 1st. Data entry took place under the supervision of IRSP team. The two files were compared in EPI-INFO VALIDATE which allowed the team to make necessary corrections.

3.8. Special Information Used during the Survey

In certain cases, it is very difficult to determine exact ages for children whose parents do not have any written documents indicating the age of their child. This is particularly true in rural areas of Benin where birth registration is not common and where the exact birth date is rarely written in official documents.

To reduce the margin in age misreporting, we developed a table to indicate the limits for children aged 18 to 36 months (a copy of this table is annexed to the document). Another table was also developed to help identify the proper measuring position according to birth date. In this table two age groups included : children 18 to 24 months of age and children 24 to 36 months of age.

When a child's estimated age is close to two years, surveyors were trained to probe for information, such as local events, that would allow them to properly situate the child's "real" age (a copy of the table to determine the correct measuring position is annexed to the document).

3.9. Method of Analysis and Discussion of the Results in Groups.

The data was analyzed on the software EPINUT in EPI-INFO. The tabulation of z-scores and their corresponding graphic representations provided information on nutritional status by sex and age group.

The discussion of results compares the reference population data from the NCHS, the Ouémé anthropometry survey results, and the 1996 DHS results for Benin.

4. RESULTS

At the end of the survey, a total of 647 children had been surveyed. During the tabulation, ten questionnaires were eliminated for the children were not within the survey's age range the. The final sample size is 637 children aged 18 to 36 months. Of the final 637 children surveyed, 303 (47.7%) were boys and 334 (52.4%) were girls. The survey took place from August 28 to August 31, 1999. 234 questionnaires were completed on 28/08/99, 234 on 6/08/99, 162 on 30/08/99, and 7 on 08/08/99.

The average age of the children surveyed was 26.47months $\pm$ 5.1 standard deviations. As table 1 illustrates, of the 637 children surveyed, 218 are within the 18 to 24 month age range, 211 in the 24 to 30 month age range, and 208 in the 30 to 36 month age group.

Of the 637 children surveyed, the birth date was verified using a card or birth book for 264 children (41.4%), according to birth certificates for 8 children (1.3%), using individual growth monitoring cards for 3 children (0.5%), and other documents for 8 children (1.3%). The ages of 354 children (55.7%) were determined with an age estimation table. In several cases, the exact birth date of the child was determined by referring to the documents of other children born in the same community.

Height was taken on 217 children in a recumbent position (34.2%) and on 420 children in a standing position. The number of children whose height was measured in the recumbent position is one unit inferior to the number of children less than 24 months of age measured in a recumbent position which was 218. Moreover, the number of children for which height was taken in the standing position is 420, whereas the number of children 24 months of age is 419. This difference is explained by the fact that one child less than 24 months of age was measured in a standing position.

The height for the 303 boys varied from 61.7 cm to 103.9 cm with an average of 82.8 cm and a standard deviation of 5.2. For the 334 girls, height varies from 68.0 cm to 96.3 cm with an average of 81.6 cm and standard deviation of 4.9. For both sexes, the average height was 82.2 cm with a standard deviation of 5.1.

The weight for the 303 boys varied from 6.6 kg to 16.2 kg with an average of 11.1 kg and a standard deviation of 1.7. For the 334 girls, weight varies from 6.7 kg. to 16.4 kg with an average of 10.3 kg and standard deviation of 1.6. For the 637 surveyed, the average weight was 10.8 kg with a standard deviation of 1.7.

During the survey, all 637 children surveyed were naked or wore light clothes and none wore heavy clothing or braids which could have interfered with height measurement. Four children, however, wore pearls whose weight was estimated at 150 to 300 grams.

The 637 questionnaires were completely filled out. Ten questionnaires were eliminated and therefore not tabulated because the age of the children concerned were beyond range.

As far as the comments section of the questionnaire is concerned, 71.4% of the questionnaires contained no comments, 22% included comments that were not really important to the analysis and frequently in relation to the child's behavior during the measuring (such as "child nervous," "child very agitated," "child cried," or "child very calm"), and additional information about means used for age estimation (such as "child's age estimated using a health book or in relation to another known, verified birth," "in relation to local festivals or political events," or "in relation to the dates for deceased family members").

For 6.6% of the questionnaires, comments were very important and concerned children's physical

deformities, their development of motor skills, and presence of clinical signs of severe malnutrition. One child illustrated signs of kwashiorkor; two were noticeably underweight; five twins were visibly small and underweight for their age; one child at the age of 28 months started walking at the age of 24 months.

Other comments provided additional information which helped explain the poor nutritional status of the child: one child was orphaned from his mother one year following his birth; one Fulani child visibly underweight and more than one year old is exclusively fed on sorghum porridge; two others with the same characteristics were breast-fed. The majority of the comments concerned the re-measuring of children when initial measures seemed too low.

Four comments mentioned that some children were wearing pearls whose weight was estimated at 150 to 300 g. Six comments concerned the health status of the children at the time of the survey: there were three cases of diarrhea, one severe, and the other two chronic; one child had temperature; three other children had scabies, and one had convulsions. birth and another child was abandoned by his mother at the age of one month.

Before describing the measures or indices of childhood nutritional status used in this study, it is necessary to present the manner in which the indices are interpreted in order to determine the nutritional status of children. In accordance with recommendations given by the World Health Organization (WHO), the estimation of nutritional status is done by comparing children of a given location to an international reference population. This reference has been established by the National Center for Health Statistics (NCHS), the Center for Disease Control and Prevention (CDC) and the World Health Organization (WHO) according to healthy American children under the age of five. The data from the international reference population are comparable for children in this age group in that whatever the population characteristics, all children follow a similar growth model from ages 0 to 5 years (DHS-Benin, 1996). The analysis most frequently used

compares the study population to reference population and tabulates the number of children who fall below -2 and -3 standard deviations of the mean for the reference population. Another analysis is to present the mean z-score for the study population. Z-score is simply the standard deviation for each child surveyed compared to the mean for the reference population. In any population, other comparisons[1] can also be made; however, we have chosen not to present them here.

Among the most frequently used methods to describe the nutritional status of children, are three existing ones based on anthropometric methods (measuring height and weight of a child), namely, *height for age, weight for height,* and *weight for age*. Each measure has its own usage and interpretation that will be briefly presented here.[2]

The height for age is an index of chronic malnutrition and a lack of growth. The index height for age does not vary much according to seasons since a child cannot "lose" height. This index measures the long term effects of inadequate nutrition or chronic, repeated illnesses. Children whose height for age falls below negative two standard deviation of the reference population mean exhibit slow growth, and those with a height for age under negative three standard deviation exhibit severe growth problems. It is worth noting that after the age of two, height for age varies little.

The index of weight for height reflects the actual nutritional situation of the child, and, therefore, could vary greatly from one season to the next if, for example, there are certain seasonal nutritional deficiencies or if the child has recently been ill. A child who does not weigh enough for his height suffers from emaciation or is too thin. A child whose weight for height is below

[1]Such as percent of median or percentile analysis.

[2]Our discussion largely follows that found in the 1996 DHS for Benin, page 150.

negative two standard deviation suffers from emaciation. And, the child whose weight for height is under negative three standard deviation is severely emaciated.

The index weight for age is a combination of the two indices already presented above. For example, it is difficult to distinguish if a child is in this situation because his height is too short for his age or because his weight is too low for his height. In any case, this index is highly recommended since it is often used in growth monitoring programs to assist mothers in following the growth of their children. A child whose weight for age is below negative two standard deviations of the mean for the reference population is underweight, and a child whose weight for age is below negative three standard deviations of the reference population's mean suffers from severe underweight.

Tables 1 to 10 on pages present the prevalence of moderate and severe stunting, underweight, and wasting as revealed by the survey by sex and by age group (18 to 23.9 months, 24 to 29.9 months, and 30 to 35.9 months). These prevalence were calculated using z-scores for the indices -height for age, weight for age, and weight for height. The final tables present the mean z-scores for each index by sex and age group.

1998 Anthropometry Survey of the Mono Department

TABLE 1 :Children Measured According to Age Group and Sex

Age Group (in months)	Boys	Girls	Both Sexes
18 to 23.9	109	109	218
24 to 29.9	95	116	211
30 to 35.9	99	109	208
18 to 35.9	303	334	637

TABLE 2 : Stunting (height for age) by Age Group and Sex
Percent below -2.00 Standard Deviations

Age Group (in months)	Boys **n = 303**	Girls **n = 334**	Both Sexes **n = 637**
18 to 23.9	43.1%	32.4%	37.8%
n = 218	n = 47	n = 35	n = 82
24 to 29.9	25.3%	31.9%	28.9%
n = 211	n = 24	n = 37	n = 61
30 to 35.9	32.7%	45.9%	39.6%
n = 208	n = 32	n = 50	n = 82
18 to 35.9	34.1%	36.8%	35.5%
n =637	n = 103	n = 123	n = 226

1998 Anthropometry Survey of the Mono Department

TABLE 3 : Underweight (weight for age) By Age Group and by Sex
Percent below -2.00 Standard deviations

Age Group (in months)	Boys n = 303	Girls n = 334	Both Sexes n = 637
18 to 23.9	32.1%	33.3%	32.7%
n = 218	n = 36	n = 36	n = 71
24 to 29.9	26.3%	39.7%	33.6%
n = 211	n = 25	n = 46	n = 71
30 to 35.9	15.2%	24.8%	20.2%
n = 208	n = 15	n = 27	n = 42
18 to 35.9	24.8%	32.9%	29.0%
n = 637	n = 75	n = 110	n = 185

TABLE 4 : Wasting (weight for age) by Age Group and Sex
Percent below -2.00 Standard Deviations

Age Group (in months)	Boys n = 303	Girls n = 334	Both Sexes n = 637
18 to 23.9	16.5%	9.3%	12.9%
n = 218	n = 18	n =10	n = 28
24 to 29.9	5.3%	17%	3.3%
n = 211	n =5	n = 2	n =7
30 to 35.9	1.0%	2.8%	1.9%
n = 208	n =1	n =3	n =4
18 to 35.9	7.9%	4.5%	6.1%
n = 637	n = 24	n = 15	n = 39

TABLE 5 : Severe Stunting (height for age) by Age Group and Sex
Percent below -3.00 Standard Deviations

Age Group (in months)	Boys n =303	Girls n = 334	Both Sexes N=637
18 to 23.9	7.3%	8.3%	7.8%
n = 218	n = 8	n = 9	n = 17
24 to 29.9	10.6%	9.6%	10.1%
n = 211	n = 10	n = 11	n = 21
30 to 35.9	10.2%	10.1%	10.1%
n = 208	n = 10	n = 11	n = 21
18 to 35.9	9.3%	9.3%	9.3%
n = 637	n = 28	n = 31	n = 59

TABLE 6 : Severe Underweight (weight for age) by Age Group and Sex
Percent below -3.00 Standard Deviations

Age Group (in months)	Boys n = 303	Girls n = 334	Both Sexes N = 637
18 to 23.9	8.3%	4.6%	6.5%
n = 218	n =9	n =5	n = 14
24 to 29.9	6.3%	6.9%	6.6%
n = 211	n = 6	n =8	n = 14
30 to 35.9	3.0%	3.7%	3.4%
n = 208	n = 3	n = 4	n =7
18 to 35.9	5.9%	5.1%	5.5%
n = 6237	n = 18	n = 17	n = 35

TABLE 7 : Severe Wasting (weight for height) by Age Group and Sex
Percent below -3.00 Standard Deviations

Age Group (in months)	Boys n = 303	Girls n = 334	Both Sexes n = 637
18 to 23.9	3.7%	0.0%	1.8%
n = 218	n =4	n = 0	n =4
24 to 29.9	1.1%	0.9%	0.9%
n = 211	n =1	n =1	n =2
30 to 35.9	0.0%	0.0%	0.0%
n = 208	n = 0	n = 0	n = 0
18 to 35.9	1.7%	0.3%	0.9%
n = 637	n =5	n =1	n =6

TABLE 8 : Mean Z-score (height for age) by Age Group and Sex

Age Group (in months)	Boys n = 303	Girls N = 334	Both Sexes n = 637
18 to 23.9			
n = 218	-1.74 ±1.00	-1.67 ± 1.07	-1.71 ± 1.04
24 to 29.9	-1.63		
n = 211	-1.27±1.13	-1.55 ± 1.20	-1.43 ± 1.24
30 to 35.9			
n = 208	-1.59 ±1.10	-1.75 ± 1.09	-1.67 ± 1.15
18 to 35.9			
n = 637	-1.54 ±1.08	-1.66 ± 1.12	-1.60 ± 1.15

TABLE 9 : Mean Z-score (weight for age) by Age Group and Sex

Age Group (in months)	Boys n = 303	Girls N = 334	Both Sexes n = 637
18 to 23.9 n = 218	-1.74 ± 0.95	-1.51 ± 1.01	-1.63 ± 0.96
24 to 29.9 n = 211	-1.21 ± 1.08	-1.59 ± 1.04	-1.42 ± 1.11
30 to 35.9 n = 208	-1.27 ± 0.92	-1.35 ± 1.03	-1.31 ± 0.94
18 to 35.9 n = 637	-1.42 ± 1.00	-1.48 ± 1.03	-1.45 ± 1.02

TABLE 10 : Mean Z-score (height for age) by Age Group and Sex

Age Group (in months)	Boys N = 303	Girls n = 334	Both Sexes n = 637
18 to 23.9 n = 218	-1.11 ± 0.97	-0.85 ± 0.92	-0.98 ± 0.93
24 to 29.9 n = 211	-0.43 ± 0.92	-0.72 ± 0.76	-0.59 ± 0.81
30 to 35.9 n = 208	-0.39 ± 0.88	-0.28 ± 0.81	-0.33 ± 0.80
18 to 35.9 n = 637	-0.66 ± 0.96	-0.62 ± 0.86	-0.64 ± 0.89

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Following the tabulation of the 637 questionnaires, the principle results of the survey show that:

- 35.5% (CI at 95% = 35.5 to 35.6) of the children aged 18 to 36 months illustrate stunting and therefore suffer from a chronic malnutrition; and among these children, 9.3% or 59 children are severely stunted,

- 29.0% (CI at 95% = 29.0 to 29.1) of the 620 children surveyed are underweight, which is severe for 5.5% or 35 children,

- only 6.1% (CI at 95% = 6.1 to 6.2) of children surveyed are wasted, which represents acute malnutrition, and

- for the 637 children, the mean z-score for stunting is -1.60 ± 1.15; it is -1.45 ± 1.02 for underweight whereas wasting represents -0.64 ± 0.89. The first two means agree with the high malnutrition rates presented by both indices.

5. DISCUSSION

The objective of the survey was to determine the distribution of anthropometric indices height for age, weight for age, and weight for height in a representative sample of children aged 18 to 36 months in the 30 rural communities randomly selected among the 58 retained by CRS in the departments of Borgou and Alibori.

The goal was to constitute a baseline database against which the impact of program activities regarding growth monitoring and nutritional status of children concerned by the new FACS program.

The methodology used to identify children, the techniques for collection information and the type of information collected permitted the survey team to meet their stated objectives.

Our discussion will concern the following aspects:

-the quality of data collected,
-the prevalence of various types of malnutrition observed in the sample,
-the malnutrition rates by sex, and
-the malnutrition rates by age group.

5.1 Quality of Data Collected

In order to guarantee the quality of data collected, care was taken in the following areas: the training of supervisors and surveyors, the sampling method, the supervision of data collection, and in the tabulation and analysis of the data.

The sample frame took into account not only the minimum sample size necessary to obtain a 95% confidence level recommended by WHO for such surveys, but also the sample size necessary for 95% in the analysis by age group and by sex. The percentage of children eliminated from the analysis following the survey due to insufficient data quality was very low (1.6%). The random selection was respected in the selection of communities and in the selection of first locality and the first household per community for the survey. Every reasonable precaution was taken in order to obtain a representative sample.

The training given to surveyors and supervisors gave the necessary skills and experience necessary to take anthropometric measurements with precision and accuracy. The training included sessions on proper measuring techniques, including the reading and recording of measurements, and a standardization test at the end of the training session followed by refresher sessions given to those who needed additional work.

During the survey, the supervision of surveyors was constant with a ratio of one supervisor per team of two surveyors. Data were also verified as they were collected. Nevertheless, given that the children aged 18 to 36 months who constitute our target group for the survey are often less cooperative and frequently agitated during the measuring, we can not presume that every error was eliminated.

5.2. Prevalence of Different Types of Malnutrition Observed in the Sample

The graphs of the distributions height for age, weight for age, and weight for height illustrate a relatively normal bell curve distribution and resemble a Gauss distribution.

In comparing the distributions of our sample with the international NCHS reference, one can note

a deviation of the project population towards the left, indicating, as expected, that the project children tend to be more malnourished than that of the reference population. It is a reality that is generally observed to varying degrees among children of developing countries.

As indicated in Tables 8 and 9, the mean values of the z-scores for height for age (-1.60) and for weight for age (-1.52) in the 30 FACS communities randomly selected during the surveys organized by CRS are lower than those found in 1997 in the Ouémé Department for the same indices (-1.79) and (-1.52), respectively, and in 1998 in the Mono Department where the indices were (-1.78) and (-1.58). These figures suggest that infant malnutrition is less common in Borgou and Alibori communities than in those of Ouémé and Mono.

These values are equally very close to the cut off points for malnutrition which is -2.0 standard deviations. This indicates that stunting and underweight reach a large portion of the children in the population.

In fact, the prevalence of stunting observed in this study is 35.5% for the whole sample with a confidence interval at 95% , confidence varying from 35.5% to 35.6% (see Table 2). According to the NCHS/CDC/WHO classification, that prevalence is very high, and is very close to those reported by Benin 1996 Demographic Health Survey (DHS) whose national stunting prevalence rates vary from 35.4% to 38.6% for children aged 12 to 35 months whereas the prevalence is 27.8% for children under 36 months in the department of Borgou.

The difference between our results and those of the 1996 DHS for the department of Borgou might be due to the fact that CRS 58 communities where the 30 clusters were drawn are part of the poorest communities, and that the DHS concerned a different age group.

The prevalence of underweight observed in this study is 29.0% for children aged 18 to 36

months with a confidence interval at 95%, confidence varying between 29.0% to 29.1%. That prevalence is inferior to Benin 1996 Demographic Health Survey (DHS) whose national rates vary from 35.4% to 38.6% for children aged 12 to 35; that prevalence is however superior to the figure of 24.5% indicated by the 1996 DHS for children under 36 months in the department of Borgou.

The apparent difference observed between our prevalence for underweight (29.0%) and that of the 1996 DHS for the Department of Borgou (24.5%) could equally be explained by difference in age group, which in our case excluded children less than 18 months of age.

The prevalence of 6.1% observed for stunting is rather low and is discordant to the high wasting rate (35.5%). This could be explained by the fact that our survey took place at the beginning of the harvest season where there is better availability of food at the household level. Moreover, the weight for height index is much more sensitive to variations in nutritional and energy intake than the height for age index.

That prevalence is also practically identical to the rate of 6.4% found by the 1996 Borgou DHS. That similarity might be explained by the fact that both surveys were practically conducted in the same periods (in August) in the department of Borgou.

The low prevalence for wasting is in accordance with the infant mortality rate, which is currently decreasing in Benin. It is currently 93.9 per 1,000 live births, whereas 21 years ago, it was 135 per 1,000 live births.

The prevalence rates of wasting observed in the departments of Oueme and Mono during CRS anthropometric surveys were 4.4% and 3.5% respectively. Both prevalence rates are higher than ours. Malnutrition is therefore less common in the department of Borgou.

1998 Anthropometry Survey of the Mono Department

5.3 Malnutrition Rates by Sex

Like the CRS anthropometry surveys in the departments of Ouémé in 1997, and in Mono in 1998, we have not observed a significant difference between boys and girls for mean z-scores for height for age (F=0.93, p=0.35), weight for age (F=0.79, p=0.43), and weight for height (F=0.25, p=0.80). We have not also observed a significant difference between both sexes for stunting, wasting, and underweight. The DHS did not identify a significant difference between the two sexes with regard to the different types of malnutrition for children under 3 years of age. This may be tied to the fact that there is no difference either physiological or physical activity to explain the energy and nutrients needs of the children that age group. There is no sexual discrimination either in terms of the care provided to the children of that age group in Benin.

5.4. Malnutrition Rates by Age Group

In the three age groups of our sample, stunting increases with age in both boys and girls. Far from indicating a higher rate for stunting by age, it rather indicates the cumulative effect of malnutrition over time. The same tendency cannot however be observed with both sexes.

For the three types of malnutrition –stunting, underweight, and wasting- the differences observed for the prevalence rates in the three age groups are statistically significant (P^2 =28; p = 0.00 for stunting ; P^2=28; p = 0.00 for underweight; and P^2 =25.9; p = 0.00 for wasting) with younger children being in the worst nutritional status.

Children aged 18 to 24 months are the most affected by wasting (12.9%), whereas the rates are 3.3% and 1.9% for the other age groups. The weight for height index whose deficiency expresses wasting, shows the child's quality of food his state of health. But that age group in Benin

corresponds to the end of the period of weaning where children are especially exposed to infections and to the discrepancy between their food intake and their nutrients needs. These results suggest that children aged 18 to 24 months are much more at risk than those older, and that infant weaning presents serious deficiencies in Borgou and Alibori Communities.

6. CONCLUSION

Infant malnutrition is a very common health issue in children aged 18 to 36 months in the communities where the CRS Food Assisted Program is being implemented. It affects more than one third of the children concerned.

The observed prevalence of stunting, low weight for height, and wasting remain much higher than those of the reference population. However, these rates mirror those found by the 1996 DHS, with the exception of wasting for which our prevalence rate is significantly less than the rate reported for children under three in the department of Borgou.

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